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INNOVATIVE USE OF DISUSED DOXYCYCLINE HYDROCHLORIDE TO DYE SILK

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ABSTRACT

Doxycycline is a synthetic broad-spectrum antibiotic used to treat infections of urinary tract, acne, gonorrhea, chlamydiosis, periodontitis, etc. Side effects can cause by taking outdated Doxycycline. Outdated Doxycycline hydrochloride drug may not safe and should be thrown out if there is any leftover. As a common practice, many times unused, or expired Doxcycline discard in the toilet but this method may not be any safer than throwing in the trash because it can contaminate water.

Deposing of drugs like Doxycycline is a major problem in today's pharmaceutical Industries. Therefore in the present study we used unexploited Doxycycline Hydrochloride Drug in textile processing.

Outdated Doxycycline reused to dye silk. This method can keep disused Doxycycline medication from being illegally abused or sold.

This method can effectively use to solve two major environmental and economical problems: limitation of environmental pollution with pharmaceutically active compounds and reduction of the disposal costs of disused drugs.

KEYWORDS: Doxycycline, Silk, Acne, Gonorrhea, Chlamydiosis, Periodontitis

INTRODUCTION

Doxycycline is a synthetic broad-spectrum antibiotic used to treat infections of urinary tract, acne, gonorrhea, chlamydiosis, periodontitis, etc.

Taking disused Doxycycline can cause serious side effects. Patients should not take such medicines if:

- Change in the color, appearance, or taste has noticed.
- The drug has been stored in proper condition as indicated by manufacturer
- The expiration date on the label has already passed

Disused Doxycycline hydrochloride drug should be thrown out or discard if there is any leftover. As a common practice, many times unused, or expired Doxcycline discard in the toilet but this method may not be any safer than throwing in the trash because it can contaminate water.

Therefore, our study was focused on the usage of disused Doxycycline Hydrochloride drug. In our previous study, Silk, Nylon, Wool and Jute have been successfully dyed with Tetracycline hydrochloride, similarly wool and nylon dyed with Doxyclycline hydrochloride by exhaust process.[1-6]

In this work we made successful attempt to dye silk fabric with disused Doxycycline. This method can effectively use to solve two major environmental and economical problems: limitation of environmental pollution with pharmaceutically active compounds and reduction of the disposal costs of disused drugs.

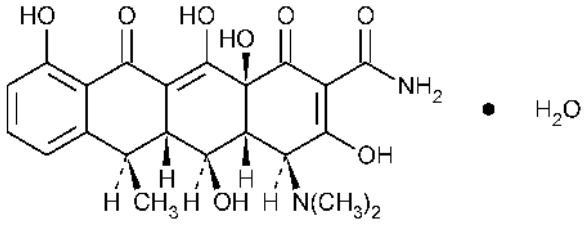
MATERIAL AND METHODS

Material

Commercially available ready for dye (RFD) silk fabric.

Drug Used

Doxycycline Hydrochloride (Trade name -Doxylab), by Laborate Pharmaceutical India Ltd, H.P.,



$C_{22}H_{24}N_2O_8 \bullet H2O$ M.W.=462.45

Chemicals

Hydrochloric Acid (HCL), Ammonium Acetate (CH3COONH4), etc. supplied by S.D. Fine Chem. Ltd. and are of AR grade.

METHODS

Dyeing of Silk

Prepared stock solution of 1% Doxycycline Hydrochloride. Silk then dyed with Doxycycline hydrochloride keeping liquor ratio of 20:1, at 100^0C for 60 min. After dyeing rinsed and dried.

Colour Measurement

Spectraflash® SF 300, Computer Colour Matching System supplied by Data color International, U.S.A. used for evaluating depth of colour of dyed sample by determining K/S values. An average of four readings taken at four different silk sample areas was used to calculate the reflectance values, and Kubelka Munk K/S function which is given by:

$$\frac{K}{S} = \frac{(1 - R)^2}{2R}$$

Where,

"R" is the reflectance at complete opacity.

"K" is the absorption coefficient.

"S" is the scattering coefficient.

Tone of the Colour is also measured on the same machine Tone of the Colour in terms of CIE L*a* and b* values.

- Washing Fastness was carried out by ISO 105-CO1.
- Light Fastness was carried out by ISO 105-B02.
- Rubbing Fastness was carried out by ISO 105-X12.

RESULTS AND DISCUSSIONS

The present work has used Doxycycline hydrochloride an antibiotic for dyeing of silk fabric. At the outset the silk fabric was dyed at 100^{o}C for 60 min and the concentration was varied between 0.5% to 3% and the results are shown in Table 1 and 2 as well as Figure 1, 2, and 3.

Table 1: Colorant Strength Calculation Values of Nylon Substrate Dyed with Doxycycline Hydrochloride

Sr. No.	TCH Conc.%	L*	a*	b*	C*	H*	Colour Strength (%)	K/S
1	0.5	75.036	1.963	8.239	8.47	76.568	100	0.5128
2	1	75.729	2.215	8.87	9.142	75.948	224.713	1.1523
3	2	76.848	2.014	9.72	9.926	78.262	462.219	2.3701
4	3	77.441	1.846	10.23	10.23	79.572	654.181	3.3545

Table 2: Fastness Properties of Silk Substrate Dyed with Doxycycline

Sr. No.	TCH	Washing Fastness	Light Fastness	Rubbing Fastness	
	%Shade			Dry	Wet
1	0.5%	3-4	5-6	5	4-5
2	1%	3-4	5-6	5	4-5
3	2%	3-4	5-6	5	4-5
4	3%	3-4	5-6	5	4-5

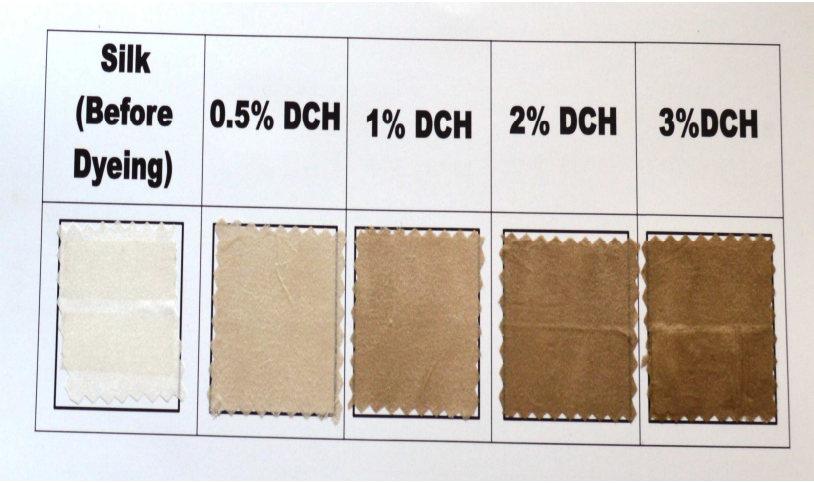


Figure 1: Shade Card of Dyeing of Silk with Doxycycline Hydrochloride at Various Concentration

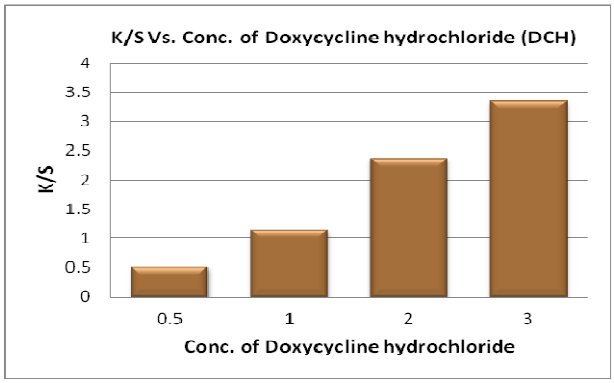


Figure 2: K/S Vs Concentration of Tetracycline Hydrochloride in %

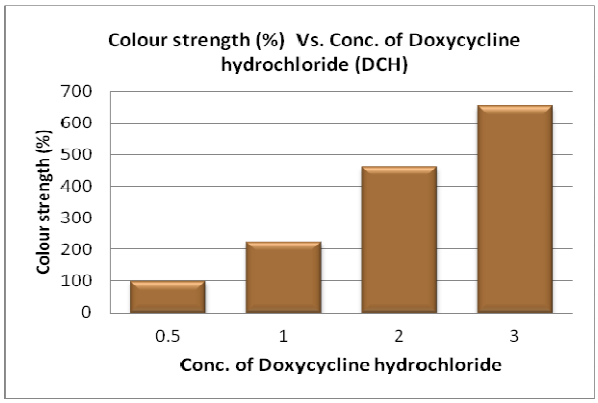


Figure 3: Colour Strength (%) Vs Concentration of Tetracycline Hydrochloride in %

The Doxycycline is light-yellow color drug. On varying the concentration of Doxycycline solution used for dyeing of silk a wide range of shade of color was obtained. Table 1 indicates that as the L value increases from 0.5 % to 3% the lightness increases which become maximum lighter at 3%, hence it has been observed that as the concentration of Doxycycline increases the lightness characteristic increases. The value of a* found to be increasing from 0.5% to 1% and then after decreases as the concentration increases. Hence it can be observe that as the concentration increases from 0.5% to 1% the fabric become redder at 1% as compare with 0.5% shade but then after it decreasing from 1% to 3% hence the greenness characteristics increases and become maximum at 3%. The value of b* increases from 0.5% to 3% which indicate that as the concentration increases, fabric become more yellower and having maximum yellower at 3% which indicate that yellowness increases as increase in %shade. From the table 1 and Figure 2 it has been observed that the K/S with increase in concentration increases and maximum at 3%. Similarly From the table 1 and Figure 3 it has been observed that the colour strength (%) with increase in concentration increases and become maximum at 3%. The hue became maximum greener and yellower at 3% concentration which can be observe by the value of Chroma C* and hue H* indicated in table 1. The fastness properties are good as seen in table 2. Hence disused Doxycycline drug can be used to dye silk fabric which may otherwise polluting the effluent.

CONCLUSIONS

Disused Doxycycline drugs may not safe and hence thrown away. We made use of disused Doxycycline drugs in dyeing of silk. The uniform level dyeing of silk can be achieved by using expired Doxycycline with a wide gamut of colors with increasing concentration.

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